

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES
NATIONAL DEFENSE UNIVERSITY

NATIONAL SECURITY MANAGEMENT STUDIES PROGRAM REPORT
ARGENTINA: MOVING TOWARDS NUCLEAR PROLIFERATION?

by

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A RESEARCH REPORT SUBMITTED TO THE FACULTY
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ABSTRACT OF STUDENT RESEARCH REPORT INDUSTRIAL COLLEGE OF THE ARMED FORCES

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ABSTRACT

Problem Statement: This paper investigates the various aspects of Argentina's civilian nuclear power program to determine if it is being used for military purposes. Four aspects of this problem were analyzed: (1) Technical Capabilities of Argentina's Nuclear Industry; (2) Status of the Argentine Nuclear Fuel Cycle; (3) Countries that have Actively Assisted Argentina in Developing its Nuclear Power Program; (4) Political Effects on the Southern Cone Region if Argentina were to Develop or Openly Move Towards Developing a Nuclear Device.

Findings/Conclusions: The significant conclusions of the study are noted below:

1. Argentina has a very mature nuclear power program and is moving to complete its independent nuclear fuel cycle.
2. Financial problems will cause Argentina to extend completion of its enrichment and reprocessing plants.
3. Argentina has the scientific and industrial infrastructure necessary for the development of nuclear weapons.
4. The future of Argentina's nuclear program lies in moving from a nuclear recipient into a position of being a nuclear supplier rather than from its position as a quasi-weapons state into a full nuclear weapons nation.
5. By 1981, Argentina had nuclear cooperation agreements with nine Latin American states.
6. Argentine politics favor a strong civilian control over its nuclear power program.

Recommendations:

1. Urge Argentina's main nuclear suppliers to cease nuclear cooperation with Argentina unless it accepts full-scope safeguards.
2. Consider establishment of a multinational fuel cycle park in South America with the incentive of the United States transferring advanced nuclear technology.
3. Employ elements of American foreign policy such as conventional arms transfers and security assurances to assist Argentina in dealing with threats from other actors in the Southern Cone.

THIS ABSTRACT IS UNCLASSIFIED

TABLE OF CONTENTS

CHAPTER	PAGE
DISCLAIMER-ABSTAINER	ii
ABSTRACT	iii
EXECUTIVE SUMMARY	viii
 I. INTRODUCTION	 1
Scope	1
Purpose	2
Definition of Terms	3
Enrichment Process	3
Fissile Materials	3
Full-Scope Safeguards	3
Gaseous Diffusion	3
Heavy Water Reactors	3
Nuclear Country	3
Nuclear Fuel Cycle	4
Nuclear Power	5
Nuclear Proliferation	5
Nuclear Supplier	5
Nuclear Technology	5
Plutonium	5
Reprocessing	5
Research Reactors	5
Uranium	5
Weapons Grade Material	5
International Atomic Energy Agency	7
Nonproliferation Treaty	10
Treaty of Tlatetolco	11
 II. ARGENTINA'S NUCLEAR POWER PROGRAM	 14
Introduction	14
The Early Years	15
Building the Framework	17
Internal Fuel Cycle	18
First Nuclear Reactor	19
Initial Reprocessing Activities	21
Current Capabilities	21
Rising Cost of Nuclear Power Plants	24
Foreign Assistance	26
 III. ARGENTINA AND GLOBAL NUCLEAR PROLIFERATION	 30
Introduction	30
Argentina Nuclear Program: A National Institution	30
Policy Toward Nuclear Treaties	32
Full-Scope Safeguards	35
Is Argentina Building a Nuclear Device?	36
International Relations and Conflict in South America	38
Introduction	38

CHAPTER	PAGE
Nuclear Conflict with Brazil	39
Argentina-Chile Conflict	41
Internal Issues	42
Nuclear Weapons Delivery Capability	43
Nuclear Exporting	45
IV. ECONOMIC AND POLITICAL FORCES INFLUENCING ARGENTINA	53
Budgetary Effects on the Nuclear Program	54
Alternatives to Nuclear Power	55
Political Controversy	56
Trends	58
V. FUTURE NUCLEAR OPTIONS FOR ARGENTINA	60
Introduction	60
User of Nuclear Technology	60
Supplier of Nuclear Technology	61
Peaceful Nuclear Explosives	62
Weapons State	63
VI. CONCLUSIONS AND RECOMMENDATIONS	68
Introduction	68
Conclusions	68
Recommendations	72
GLOSSARY	75
SELECTED BIBLIOGRAPHY	76

LIST OF ILLUSTRATIONS

FIGURE	PAGE
1. A Closed Nuclear Fuel Cycle	4

LIST OF TABLES

TABLE	PAGE
1. Spent Fuel Reprocessing Plants	6
2. Threshold Amounts and Quantities of Safeguards Significant Nuclear Materials	9
3. Estimated Material Conversion Times	10
4. Argentina Nuclear Fuel Cycle Activities	23

EXECUTIVE SUMMARY

This study analyzes the status and capabilities of the Argentina nuclear power program. The strengths and liabilities of the Argentine program are examined from both a historical and contemporary viewpoint.

The study investigates Argentina's national capability to develop and deploy a small nuclear weapons force. The aspect of regional stability is examined from views of actors in the Southern Cone. The paper presents a list of options that are available to Argentina with respect to its nuclear future. Although Argentina declares its nuclear policy to be for strictly peaceful users, it has sought to keep open its nuclear option. This policy decision will be analyzed in the paper.

The impact of the international community, especially the International Atomic Energy Agency, on Argentina's nuclear future will be investigated. Other aspects of the international arena such as the failure of Argentina to ratify or sign two major nonproliferation treaties are discussed.

The significant conclusions of the study are:

1. Argentina has a very mature nuclear power program and is moving to complete its independent nuclear fuel cycle.
2. Extreme financial difficulties within Argentina will cause President Alfonsín to reexamine the direction and requirement to continue the development of a closed fuel cycle. Due to national prestige, regional leverage, and potential export revenues, Argentina will probably continue the fabrication of its enrichment and reprocessing plants but on an extended schedule.

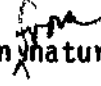
3. There is no reason to anticipate that Argentina will sign the Nonproliferation Treaty and ratify the Treaty of Tlatelalco in the near future. Although there is a general softening of President Alfonsin on these treaties, there probably will be no chance of acceptance by the Argentine Congress and the general public.
4. There is little question that Argentina today has the general scientific and industrial infrastructure necessary for the development of nuclear weapons. Also, they have developed and tested the Condor C1-A3 solid fuel rocket that has a range of 75-150 km and a throw-weight of between 350-475 kgs. This high performance, multi-purpose vehicle has been designed for the space market, but also has potential tactical applications. A longer range (800 miles), two-stage version of the Condor C1 is already under development.
5. The future nuclear choices of Argentina can be grouped in four broad options: (1) using nuclear technology in electric power applications and for other civilian, nonexplosive purposes; (2) supplying other nations with nuclear technology; (3) developing peaceful nuclear explosives; and (4) developing a small nuclear weapons force for military purposes. Argentina's nuclear choice is not predetermined. Many factors influence the choice. The acquisition of nuclear weapons by Argentina would put strong pressure on another country in the region, Brazil, to do the same. Argentina has a strong desire to expand and diversify and master all aspects of nuclear energy. The future for Argentina lies in moving from a nuclear recipient into a position

of being a nuclear supplier rather than from its position as a quasi-weapons state into a full nuclear weapons nation.

6. By 1981, Argentina had nuclear cooperation agreements with nine Latin American states, including Brazil. Argentina has provided extensive training and financial support to Peru. Also, Argentina is providing research reactors to Uruguay and Columbia. During April 1985, Argentina and China signed an umbrella agreement covering peaceful applications of nuclear energy. In June 1985, it was announced that Argentina will build a 500 kw research reactor for Algeria, representing Argentina's first major agreement of its kind with a Middle East country.
7. Internal Argentine politics will be a strong factor in the future direction of its nuclear program as the civilian government tries to strengthen control over the military. President Alfonsin is proposing legislation that would reorganize the Comision Nacional de Energia Atomica and create two independent committees to monitor the agency's accountability for nuclear materials.

CHAPTER I

INTRODUCTION

Science has torn ~~nature~~  a secret so vast in its potentialities that our minds cower from the terror it creates. Yet terror is not enough to inhibit the use of the atomic bomb. The terror created by weapons has never stopped man from employing them.

Bernard M. Baruch
United States Representative, June 1946
United Nations Atomic Energy Commission¹

Scope

The diffusion of nuclear technology in the Third World and the possibility of nuclear weapons proliferation is one of the most acute security concerns confronting the United States and the civilized world. Unless the diffusion of nuclear technology is arrested, a world of possibly 20 or more nuclear weapon states may emerge by the year 2000.² Currently, there are five nuclear weapon states in the world: United States, Soviet Union, United Kingdom, France, and China.

There is sound rationale for the increased use of atomic energy based upon agricultural requirements, energy needs, and economic development. While we can logically apply the same issues regarding the opposition of nuclear generated plants to fossil units, the potential of misusing nuclear power is catastrophic. The acquisition of nuclear materials and fuel cycle

facilities can be utilized to develop nuclear weapons and create world concern and regional disequilibrium.

The unfortunate aspect of the ultimate decision of a Third World country to acquire nuclear technology is frequently based on foreign policy issues rather than on domestic considerations. The decision to pursue a nuclear program can springboard a country into the upward spiraling world of high technology and the establishment of a large debt. The costs of nuclear plants are often underestimated and the actual construction is often delayed and subject to cost overruns. For a developing country, the above problems often lead to an economic crisis.

The Indian Government on May 18, 1974, detonated a "peaceful" nuclear explosive device underground in the Rajasthan Desert. The plutonium utilized in the device was produced from a research reactor.³ This example pinpoints the fear that other countries may follow the historical past of nations using ostensibly civil nuclear programs^S_A for military purposes.

Purpose

The purpose of this paper is to analyze the various aspects of Argentina's civilian nuclear power program to determine if it is being used for military purposes. Also, consideration will be given to the future direction of Argentina's nuclear program and to whether it is moving towards becoming an exporter of nuclear technology. This paper will specifically discuss the technical capabilities of Argentina's nuclear industry and the current status of their nuclear fuel cycle. Of particular interest, it will explore which countries have actively assisted Argentina in developing its nuclear power program. From a political vantage, the paper will examine the potential effects on the South American region if

Argentina were to develop or openly move towards developing a nuclear device.

It should be noted that all the data and assumptions contained in this research report resulted entirely from the review and analysis of unclassified publications.

Definition of Terms

The following definition of terms are provided to assist in understanding the salient elements of nuclear power and the impact and direction of Argentina's civilian program.

Enrichment Process - A highly technical process, usually gaseous diffusion, by which the isotope uranium 235 is enriched for use as a fuel in power and research reactors. The gaseous diffusion process requires a very large industrial complex and vast amounts of electricity.

Fissile Materials - A material capable of sustaining a chain reaction.

Full-Scope Safeguards - A procedure placing all of a country's civilian nuclear facilities under international review.

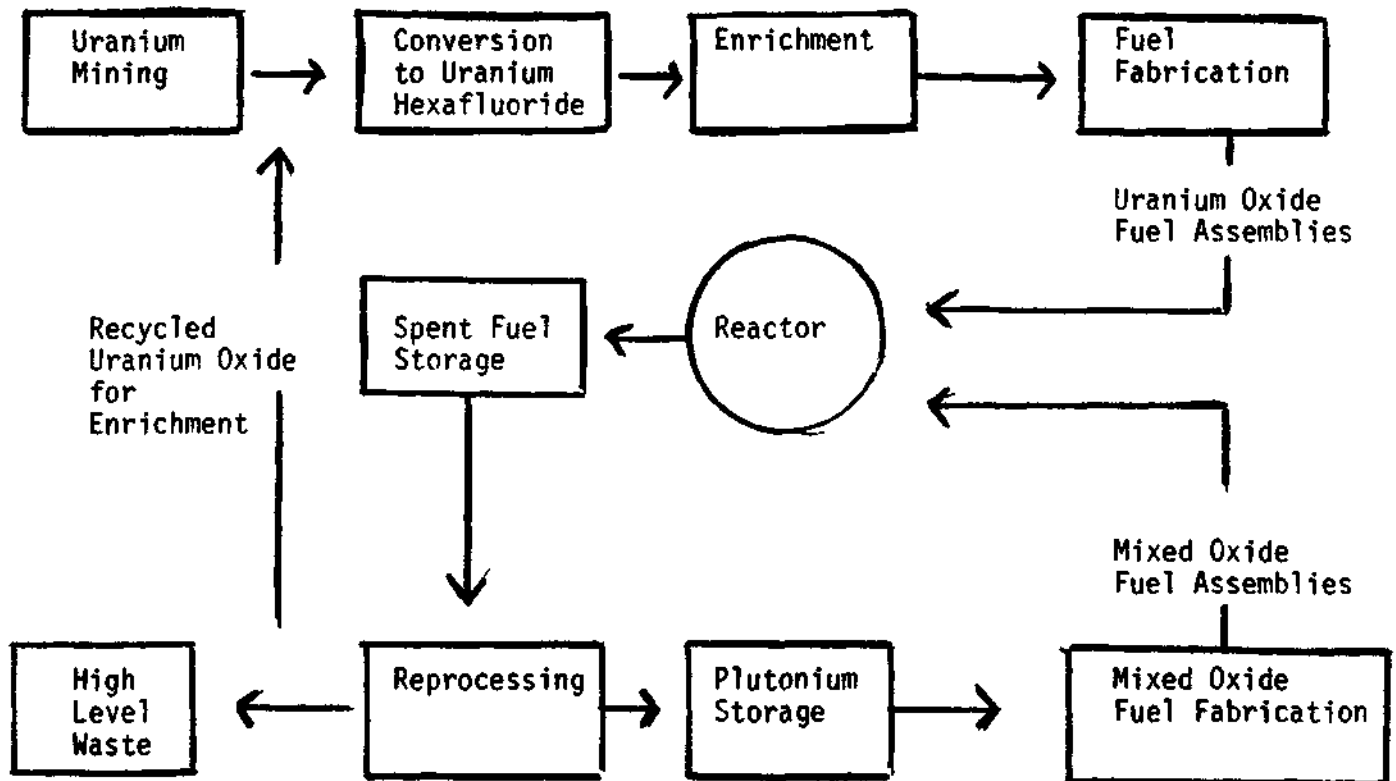
Gaseous Diffusion - A method of isotope separation which passes atoms of different masses through a porous barrier. This was the first successfully demonstrated method for large scale production of enriched uranium. Subsequently, more energy efficient separation techniques have been developed such as gas centrifuge.

Heavy Water Reactors - A heavy water reactor utilizes natural uranium fuel elements which are moderated by heavy water.⁴

Nuclear Country - A country in which a nuclear power station is under construction or in operation.

Nuclear Fuel Cycle - The fuel cycle consists of the mining of uranium ores, enrichment of uranium, fabrication of nuclear fuels, use of the fuel, reprocessing of spent fuel, and disposal of radioactive waste.⁵

FIGURE 1
A CLOSED NUCLEAR FUEL CYCLE⁵



Nuclear Power - Generation of energy (electricity) through a nuclear chain reaction process for civilian purposes.

Nuclear Proliferation - The acquisition of nuclear explosives or weapons by a country.

Nuclear Supplier - Countries whose governments and industries transfer nuclear technology and equipment to other nations. The main suppliers are Japan and countries in North America and Europe.⁶

Nuclear Technology - This refers to the transfer of technical reports, nuclear laboratories or prototype plants and the use of radioisotopes for medical and agricultural purposes.⁷

Plutonium - A byproduct created as a result of fission process in a nuclear reactor. The plutonium created in a uranium fuel rod can be extracted by chemically reprocessing the "spent" fuel rod.

Reprocessing - Fuel reprocessing is the mechanical and chemical operation in the nuclear fuel cycle by which plutonium and unused uranium are recovered from spent nuclear fuel.⁸ Listed in Table 1 are the reprocessing plants in operation or scheduled for operation throughout the world.

Research Reactors - These are reactors which are fueled by highly enriched uranium (usually between 20-90 percent uranium 235), produces very little power and are used in radiation affects experiments.¹⁰

Uranium - Uranium-235 is the principle fissile isotope. Its concentration is typically enriched to a few percent for use in Pressurized Water Reactors.

Weapons Grade Material - Uranium enriched to 20 percent or more in the isotope U-235 or plutonium in which the concentration of the isotope Pu-239 is greater than 93 percent.¹¹

TABLE 1
SPENT FUEL REPROCESSING PLANTS⁹

<u>Country</u>	<u>Mission</u>	<u>Operational</u>
Argentina	Process demonstration Reprocess Domestic Heavy Water Reactor Fuels	Target: 1987 Target: Late 1980's
Belgium	Demonstrate reprocessing of varied fuels	1966-1974; may be recommissioned in 1986 or 1987
Brazil	Process demonstration Reprocess Light Water Reactor (LWR) Fuels	Target: 1986 Unknown
Peoples' Republic of China	Reprocess military fuels	Unknown
France	Reprocess military and civilian uranium metal fuels	1958-Present
Germany	Pilot Plant for process and component testing - LWR Fuels Commercial Plant for LWR Fuels	1971-Present Target: 1990
India	Reprocess Test Reactor Fuels Reprocess HWR and Boiling Water Reactors	1983-Present 1976-Present
Israel	Plutonium Production	Not known
Italy	Process demonstration Reprocess varied fuels	1970-Present
Japan	Develop and test LWR reprocessing technology	1977-Present
Pakistan	Plutonium Production	Unknown
Soviet Union	Reprocess military fuels Process development for LWR fuels	1973-Present Unknown
United Kingdom	Reprocess civilian and military uranium metal fuels	1964-Present
United States	Military fuel reprocessing	1955-Present

International Atomic Energy Agency

The influence of international organizations on a developing country's nuclear energy policies depends upon ²⁴⁰¹its mandate and available funds. One such organization is the International Atomic Energy Agency (IAEA). On July 29, 1982, the IAEA celebrated its twenty-fifth year of service to the international community.¹² The establishment of the IAEA was first suggested on December 8, 1953, in President Dwight Eisenhower's Atoms for Peace address before the UN General Assembly. The statute of the IAEA proclaimed the objectives of accelerating the use of nuclear energy for food and agriculture, medicine, and economic development while ensuring the assistance provided through these programs would not be used to further the military purposes of a country.¹³

In the early years, the IAEA efforts were mainly directed to assisting the development of Third World countries. After 1966, the emphasis of the IAEA gradually shifted from reactor theory to practical aspects of nuclear power stations. By the late 1970's, approximately one-third of all training courses were devoted to nuclear developing member states.

The IAEA has regulatory as well as promotional responsibilities. Safeguards first developed bilaterally, in special clauses to cooperation agreements reserving the right of the export country to verify that the recipient country did not divert fissile material for military purposes.¹⁴ When the United States began transferring the administration of bilateral agreements to the IAEA, some members voluntarily submitted nuclear activities to IAEA safeguards.¹⁵ During this period, safeguards concerned only the material or nuclear plant which they were intended to protect from possible diversion of civilian nuclear energy to military purposes. Therefore, it was quite possible for a country to have one reactor under

safeguards and just next to it another reactor - built either purely by national means or with the help of a country that did not require safeguards - which could be used for other than peaceful purposes.¹⁶ The Nonproliferation Treaty of 1968 (NPT) sought to reduce this problem through one of the treaty's articles which requires that agreements must be concluded to safeguard fissile material in all peaceful nuclear activities within the territory of nonweapon states that signed the treaty. This approach is call full-scope safeguards. The United States and Canada pursued a more drastic approach in that they attempted to extend full-scope safeguards to non-NPT members. This suggestion met strong resistance from such countries as Argentina and India.

Once the decision to "go nuclear" by one of the non-nuclear weapon states that signed the NPT, the IAEA and its safeguards procedures become relevant. Here the IAEA administers a far-reaching program of onsite inspections and the use of surveillance equipment such as cameras to record unauthorized movement of nuclear materials. The reviews in some cases are performed by resident inspectors. The inspections are coupled with the requirement that facility operators maintain selected records, report promptly and regularly, and submit information to the IAEA about the design of their plants.¹⁷

The single most important objective of IAEA safeguards is the timely detection of diverting significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons and deterrence of such diversion by the risk of early detection. Significant quantities have been expressed in terms of "threshold amounts" which are the quantities necessary for fabrication of a nuclear explosive device. Table 2 lists these values. Timely detection is expressed as "detection

time" which has been defined as the minimum time required to convert specific forms of nuclear material to the form necessary for the fabrication of a nuclear explosive. These times are given in Table 3 and are only guidelines since some flexibility must be allowed.¹⁸

TABLE 2
THRESHOLD AMOUNTS AND QUANTITIES OF SAFEGUARDS
SIGNIFICANT NUCLEAR MATERIALS¹⁹

A. Threshold Amounts

<u>Material</u>	<u>Threshold Amount (TA)</u>	<u>TA Applies To:</u>
Pu (Pu-239 > 95%)	8kg	Total Element
U-233	8kg	Total Isotope
U (U-235 > 95%)	25kg	U-235

B. Quantities of Safeguards Significance

<u>Material</u>	<u>Quantity of Safeguards Significance (SQ)</u>	<u>SQ Applies To:</u>
"Direct Use Material" Pu	8kg	Total Element
U-233	8kg	Total Isotope
U (U-235 > 20%)	25kg	U-235
"Indirect Use Material" U (U-235 < 20%)	75kg	U-235
Th	20t	Total Element

TABLE 3
ESTIMATED MATERIAL CONVERSION TIMES²⁰

<u>Beginning Material Form</u>	<u>End Process Form</u>	<u>Estimated Conversion Time</u>
Pu, HEU, or U-233 metal	Finished plutonium or uranium metal components	Order of days (7-10)
PuO ₂ or other pure compounds. Highly enriched uranium [(HEU) > 20% U-235] or U-233 oxide or other pure compounds. Mixed Oxide [(MOX) combination of uranium and plutonium] or other non-irradiated pure mixtures of Pu or U [(U-233 + U-235) > 20%]	Finished plutonium or uranium metal components	Order of weeks (1-3)
Pu, HEU, or U-233 in irradiated fuels	Finished plutonium or uranium metal components	Order of months (1-3)
U containing < 20% U-235 and U-233, thorium	Finished plutonium or uranium metal components	Order of one year

Nonproliferation Treaty

The aim of the nonproliferation treaty of 1968 is to prevent the spread of nuclear weapons while at the same time reaffirming a commitment to the development of nuclear energy for peaceful purposes.

Parties to the NPT accept a system of verification to ensure they are in compliance with the provisions of the treaty. This involves safeguards agreements between the state and the IAEA. Safeguards are seen by nuclear supplier states as a vital element to foster international nuclear trade and a prerequisite for the export of nuclear materials.²¹

Treaty of Tlatelolco

Latin America is the only populated area of the world to have been officially declared a Nuclear Weapon Free Zone (NWFZ). Provisions for the zone were made in 1967 by the treaty, which is now in force for 22 countries. Argentina has signed but not ratified the treaty. There are two important protocols to the treaty. Protocol I commits nations with territories in Latin America or in the Caribbean not to manufacture, use or store nuclear weapons in those territories. Protocol II, which is open to signature by nuclear weapon states, requests them to respect the Latin America NWFZ. The United States has signed and ratified both protocols.²²

FOOTNOTES

CHAPTER I

¹U.S. Congress, Senate Committee on Governmental Affairs, Subcommittee on Energy, Nuclear Proliferation and Federal Services, and House Committee on Foreign Affairs, Subcommittee on International Economic Policy and Trade, Nuclear Proliferation Factbook, (Washington: U.S. Government Printing Office, 1980), p. 13.

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⁶Daniel Poneman, p. 8.

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⁸P. J. Mellinger, K. M. Harmon, and L. T. Lakely. Pacific Northwest Laboratory, A Summary of Nuclear Fuel Reprocessing Activities Around the World, PNL-4981. (Richland, Washington: 1984).

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¹⁰International Atomic Energy Agency, IAEA Safeguards: Implementation at Nuclear Fuel Cycle Facilities, (Vienna: 1985).

¹¹U.S. Department of Energy, Protection of DOE Security Interests, DOE 5632.2, Attachment 2, (Washington: 1985), p. 1.

¹²International Atomic Energy Agency, International Atomic Energy Agency Bulletin, (Vienna: 1982).

¹³Ibid.

¹⁴International Atomic Energy Agency, Summary Information Concerning Safeguards, (Vienna: 1982).

¹⁵Ibid.

¹⁶Ibid.

¹⁷International Atomic Energy Agency, International Atomic Energy Agency Bulletin, (Vienna: Supplemental 1982).

¹⁸U.S. Nuclear Regulatory Commission, Alternative Nuclear Arrangements for Proliferation Resistance.

¹⁹Ibid.

²⁰Ibid.

²¹Nuclear Options in Latin America, (London: 1983), p. 2.

²²Ibid., p. 1.

CHAPTER II

ARGENTINA'S NUCLEAR POWER PROGRAM

I am become Death, the destroyer of worlds.

Robert J. Oppenheimer¹
Trinity Site, July 1945
Alamogordo, New Mexico

Introduction

The rain stopped at 4:00 a.m. At 4:45 a.m., the crucial weather report came: "Winds aloft, very light, variable to 40,000, surface calm. Inversion about 17,000 feet. Humidity 12,000 to 18,000 about 80 percent. Conditions holding for next 2 hours. Sky now broken becoming scattered." The wind directions and velocities at all levels to 30,000 feet looked good from a safety standpoint. Test personnel consulted with Oppenheimer on the phone. One dissenting vote could have called off the test. The decision was made. The detonation of the world's first nuclear device would occur at 5:30. At that instant - 5:29:45 a.m. Mountain War Time on July 16, 1945 - came an incredible burst of light, bathing the surrounding mountains of Alamogordo, New Mexico in an unearthly brilliance. The world entered the nuclear age full of promise and with great foreboding. Time stood still for many scientists witnessing this historic event. Words for most part were unable to describe the event which took place in the desert of New Mexico in 1945, but Robert Oppenheimer said the intensity of the nuclear detonation reminded him of an ancient Hindu quotation that was used to introduce this chapter.²

The Early Years

Just one month after the United States utilized nuclear devices at Hiroshima and Nagasaki, the Argentine junta proclaimed the importance of uranium and that the use of the material for industrial energy would be seen within a relatively brief period. Under the guidance of President Juan Peron, Dr. Ronald Richter, an Austrian emigre from the Nazi fusion program, set up a research laboratory.

Over the next few years, Peron's regime grew troubled. There was labor and party discontent, inflation, and growing political opposition. Since Peron faced elections within a year, he wished to quell internal opposition quickly and salvage his position. On March 24, 1951, he summoned a press conference to announce a stunning development. Peron read a prepared statement, which was broadcast simultaneously to the nation, that announced "... a fusion experiment had been carried out on February 15, 1951, in an atomic energy pilot plant on Huelmo Island at San Carlos de Bariloche."³ The statement further indicated that uranium had not been used. Later, Dr. Richter attempted to substantiate the claim by indicating the reaction was contained in a huge solar kiln. Enrico Fermi, father of the first self-sustaining fusion reaction, labeled the claim "rather strange," while two German Nobel Laureates termed it "fantastic."⁴

Publicly, Peron expressed confidence with respect to the ability of Dr. Richter. To that end, Peron announced if Dr. Richter's experiments continued in a positive vein, Argentina would have within 2 years their first nuclear power plant generating electricity for the entire country. Privately, however, Peron must have had some misgivings about Dr. Richter as he assumed complete control of Argentina's nuclear research and development program.⁵ In addition, internal pressures against Richter mounted. In order to partly investigate Richter's experiment, a National

Atomic Energy Commission (Comision Nacional de Energia Atomica, or CNEA) was established by presidential decree in 1950. In 1952, the research staff on Nuemul Island was purged and Richter fired. After the 1955 overthrow of the Peron Government, President Aramburu declassified the documents surrounding Richter's experiments, which convinced an investigating committee that Richter was a fraud who had squandered some \$70 million. CNEA was ordered to hire qualified personnel and to establish meaningful objectives for nuclear research and development.⁶

The history of Argentina's nuclear energy development can be divided into four distinct periods:⁷

- During the first period (1950-1958), R&D groups were formed and personnel were trained in foreign institutions;
- In the second period (1958-1967), a research reactor was constructed, metallurgy R&D and fabrication of fuel elements for this reactor was carried out, a uranium mill was constructed and radioisotopes were produced for applications in medicine, biology, industry, and agriculture;
- During the third period (1967-1976), Argentina began its activities of generating electricity from nuclear energy. In 1974, commercial operation began for a natural uranium, pressurized heavy water nuclear power plant. In 1973, a Canadian-Italian Consortium, AECL-Italimpianti, began construction of a second heavy water nuclear plant of 600 megawatts; and
- During the fourth period, starting in 1977, effort was concentrated on closing the fuel cycle and acquiring the internal capability of designing and constructing nuclear power plants.

Building the Framework

Although the Argentine nuclear program began in a tumultuous fashion, its success undoubtedly came from the fact that it got a very early start.⁸ Only five years after the first nuclear bomb was dropped on Hiroshima and revealed to the world the power locked inside the atom, and three full years before President Eisenhower's famous Atoms for Peace speech lent U.S. approval to the development of the atom, Argentina began its own independent effort to unlock the secrets of the atom.⁹ With the establishment of the CNEA, this organization was utilized to guide the direction of the Argentine nuclear power program "at a time when even the most basic information about nuclear reactors was still highly classified in many nations."¹⁰ The framework was initiated in 1952 when Naval Captain Pedro E. Iraolagoitia succeeded Enrique as president of CNEA.¹¹ Captain Iraolagoitia hired skilled workers and facilitated "the first serious development of nuclear technology" in Argentina. As its first objective, the CNEA committed itself to the development of a nuclear program that would ensure domestic self-sufficiency.¹² Technicians of the CNEA immediately began to perform surveys of domestic natural uranium deposits to determine if sufficient reserves were available to undertake a long-term nuclear power program.

After assuring there ^{was} adequate uranium supplies, CNEA turned its attention to the development and training of a cadre of well-qualified scientists and engineers.¹³ A number of nuclear research centers were established around the country, with the chief educational institution located in the southern Andean resort of Bariloche.¹⁴ Following the establishment of the scientific institutions, a significant number of foreign experts were brought into the country to train CNEA personnel.

The Argentine nuclear power program received a substantial boost from the United States through the Atoms for Peace program.¹⁴ In 1955, Argentina signed a nuclear cooperation agreement with the United States that eventually provided for the training of over 200 Argentine scientists under the auspices of the former Atomic Energy Commission (AEC).¹⁵ By 1958, with help from the AEC and the IAEA, Argentina had acquired an operational research reactor.¹⁶

After the 1955 coup which toppled Juan Peron, the CNEA was granted autonomous status, with the authority to set up its own objectives with a central theme of nuclear independence.¹⁷ In 1960, the CNEA was converted into a state agency directly under the President and divided into five departments covering: raw materials, technology, energy, research, and safety. The CNEA board of directors, formed in 1960, maintained extraordinary continuity, holding their posts over 12 years. Backed by the military, the CNEA won a place for the nuclear program among the various government projects. With its infrastructure firmly in place, Argentina was now ready by the mid-1960's to begin negotiations to purchase its first nuclear power plant.¹⁸

Internal Fuel Cycle

During the period 1967 to 1980, CNEA established program goals to complete three nuclear power stations, to install most facilities necessary for the manufacture and disposition of nuclear fuel, and to stay abreast of the world progress in plutonium reprocessing and breeder reactor technology.¹⁹

Although the Argentine Government never pursued the development of the breeder reactor, they did construct a laboratory-scale reprocessing plant

from which they extracted plutonium from spent reactor fuel rods.²⁰ By 1971, five research reactors had entered in operation. However, their optimistic plans to reach an early self-sufficient nuclear fuel cycle were not achieved. From the 1960's and throughout the 1970's, their plans to increase uranium ore milling and build heavy water production plants were met with excessive slippages.²¹ As a result, CNEA was not able to have a commercial fuel element production nor heavy water plant in operation by the end of the 1970's. However, progress was made toward its goal of nuclear power plant construction by conducting a feasibility study for a second power plant.²²

With the return of the exiled Juan Peron, internal upheaval took place within the CNEA. It was hoped that a nonpartisan CNEA would continue to function. However, it was soon evident that top officials of the CNEA would be replaced by supporters of the new government. As a result, many talented scientists and engineers left CNEA.

Following the ouster of Isabel Peron in 1976, improvements were in the wings for the CNEA. The flight of engineers ceased and they began to hire qualified technicians and scientists. The single most important policy objective of the new government was to initiate closing the nuclear fuel cycle.

First Nuclear Reactor

By the mid-1960's, Argentina began negotiations to purchase its first nuclear power plant and they selected not a German natural-uranium, heavy water reactor, as widely reported, but a French natural-uranium, gas-graphite reactor. At the last minute, however, France backed out without explanation. One factor that most likely triggered Argentine

interest in the French reactor was that it used natural uranium fuel thereby avoiding ongoing dependence on the United States, the sole supplier of the enriched uranium fuel the more widely used U.S.-style light water reactors would have required. Another factor that may have influenced Argentina was that the reactor was particularly well suited to producing plutonium for nuclear weapons and is a model similar to the one France used to produce plutonium for its own nuclear weapons program.²³ What arrangements might have covered the sale had it gone through are not known, nor is the extent to which French proliferation concerns influenced its decision to cancel the deal. An internal CNEA study concluded that Argentine industry could participate in an estimated 40 to 50 percent of the construction and operation of the reactor. It was believed that this large element of local participation would elicit the support of businessmen and government officials who wished to stimulate the growth and quality of industrial development.

After the French cancelled the deal, CNEA made a careful study of the alternatives. The Canadian and German offers were the most attractive.

Argentina also sought to maintain autonomy over its use of its first nuclear power plant, Atucha I, by limiting IAEA oversight of the facility.²⁴ Although Buenos Aires acceded to West Germany's requirement that the plant be subject to an IAEA safeguards requirement, Argentina insisted when it negotiated the accord with the agency several years later that safeguards would be applied to the plant only for an initial term of 5 years, to be extended as both parties deemed appropriate, i.e., only if Argentina subsequently agreed to extensions.²⁵ The Argentine effort to exploit the loophole in the Atucha I agreement with Bonn might have succeeded but for the fact that to obtain heavy water for the reactor from

the United States, Argentina was obliged to accept long-term safeguards on the plant. The Atucha I plant began generating electricity in 1974.²⁶

Initial Reprocessing Activities

In concert with its efforts to limit the duration of safeguards on Atucha I, the CNEA began construction of a laboratory-scale reprocessing facility for extracting plutonium from spent fuel rods. The plant, which consisted of a number of laboratory hot cells for handling radioactive materials, became operational in 1969 and operated intermittently until it was dismantled in 1973.²⁷ Despite Argentina's rejection of the Nonproliferation and Tlatelolco Treaties, the United States granted approval to Argentina to reprocess approximately 13 kilograms (1 kilogram = 2.2 pounds) of U.S.-supplied spent uranium fuel from the RA-1 research reactor.²⁸ The plant produced only small amounts of plutonium probably less than 1 kilogram. Even if its output was small, the plant provided Argentine scientists with invaluable experience in this phase of the fuel cycle and laid the basis for development, a decade later, of a larger reprocessing facility.²⁹

Current Capabilities

Argentina has a long-term supply of natural uranium that will last well into the twenty-first century under projected use levels. Current estimates place it at least 11,000 tons of uranium with projections of much higher amounts.³⁰ The mining industry of Argentina furnishes much of the material that it needs.

Argentina builds its own fuel elements, with those for the research reactors entirely Argentine, while the elements for the power generating

reactors are partially and increasingly made in Argentina.³¹ Argentina is the first nation outside of the United States, the Soviet Union, and France to manufacture pure zirconium which is crucial to the production of fuel rods.³² An industrial scale fuel element production facility is located at Ezeiza.

Argentina has five generating nuclear research reactors as of mid-1984 which require enriched uranium from abroad to operate.³³ It also has two operating power generating reactors. Atucha I is located outside of Buenos Aires on the Parana River with a capacity of 320 Mw and, as previously mentioned, opened 11 years ago. Embalse on Rio Tercero Lake in Cordoba Province generates 600 Mw.³⁴ A third reactor, Atucha II, a twin facility for the Atucha center north of Buenos Aires, is projected to open in 1989 or 1990. Additionally, there are three reactors in the planning stage.

Argentina continues to seek its own reprocessing capability for spent nuclear fuel. From a proliferation issue, this is the most dangerous segment of the nuclear fuel cycle because weapons grade plutonium is available at this point.

In 1974, the Embalse reprocessing facility which was under construction at that time, was held up briefly by individuals who were having a dispute with the government.³⁵ If a terrorist group was able to seize such a facility, they could either steal the plutonium to make a crude improvised nuclear device or use the material in a blackmail plot.

A more basic question arises as to the need Argentina has for reprocessing. The rationale for the Argentine reprocessing facility becomes somewhat clearer when two other national capabilities are added to the equation. These are the enrichment facility that Castro Madero

admitted that Argentina is building and the plans that the republic has for a spent fuel storage area that could service the whole of Latin America.³⁶ In a heavy water reactor system and the accompanying closed fuel cycle that Argentina has worked for over a period of over 16 years, there is little need for an enrichment facility. The announcement of an enrichment facility raises a red flag in the international community.³⁷ The two ways to obtain a bomb are to have an enrichment capability to take the U-235 to greater than 90 percent or to extract plutonium from the fuel cycle through a reprocessing facility such as the one that Argentina seeks to have.

The other explanation may be that Argentina is working to become a major nuclear exporter state. If this is the case, then Argentina would be able to justify the enrichment and reprocessing plants because states that export nuclear material and technology would require such facilities.

This concept will be further developed in Chapter IV. The Argentine fuel cycle activities are noted in Table 4.

TABLE 4
ARGENTINE NUCLEAR FUEL CYCLE ACTIVITIES³⁸

<u>Category</u>	<u>Status</u>
Uranium resources	30,363 tons of reasonably assured resources, plus 18,000-25,000 tons of estimated additional resources.
Uranium milling	Three plants are in operation, with three more planned. Currently, 180-220 tons of yellowcake (U_3O_8) are milled annually.
Uranium conversion (from U_3O_8 to UO_2)	One West German-supplied plant has a 150-ton annual capacity. The project to build an Argentine plant of equal capacity has been delayed.
Fuel element fabrication	A 1976 Argentine pilot plant at Constituyentes has fabricated 240 elements now in use at Atucha I. This pilot plant will be moved to Ezeiza, where an industrial-scale plant is

	planned, but has been delayed. The initial production capacity of the new plant will be approximately 400 elements per year.
Zirconium production	A 1-ton-per-year pilot plant at Bariloche has been in operation since 1978, producing zirconium sponge. A plant at Pilcaniyeu in Rio Negro is planned to produce metallic zirconium from either local minerals or imports.
Zircaloy production	An alloys factory has been built, and a tube plant is under construction.
Heavy water production	The \$300 million, 250-ton-per-year Sulzer Brothers plant at Arroyito in Neuquen Province is scheduled for startup in late 1980's. An Argentine, 2-ton pilot plant is over 60 percent complete, but has been delayed. This pilot plant is intended to form the basis for an indigenously designed, 250-ton heavy water plant. Construction on the larger plant has begun at Atucha.
Uranium enrichment	Success in pilot-scale enrichment, by the gaseous diffusion method, announced.
Spent fuel	A second spent fuel storage pool at Atucha I is complete and received its first irradiated elements in May 1982.
Plutonium reprocessing	The plant will have a daily capacity of 20 kg of spent fuel. The originally scheduled August 1982 completion has been pushed back to the late 1980's.
Waste disposal	Field study underway for underground geological storage at Sierra de Media, about 50 km from Gastre (northwest of Rawson, in Chubut Province). The study includes preliminary engineering work.

Rising Cost of Nuclear Power

Within the United States, nuclear power, after 35 years, is losing its appeal. The problems in this country are very complex. They include: unnecessary ^{long} acquisition cycles; softness in demand; lack of public acceptance; and ineffective management. As a result, power plants in the

United States have been cancelled or those built have not opened.³⁹ Britain has moved away from nuclear energy, partially due to the escalating costs of nuclear power plants and the safety risks involved.⁴⁰ The disaster of Three Mile Island (TMI) has irrevocably altered the view on nuclear power as well as increased the costs of operating nuclear power plants due to new safety requirements. For example, the Browns Ferry Nuclear Plant was supposed to be the showcase of the Tennessee Valley Authority's (TVA) nuclear power system, producing more power in 1 year than all of TVA's 29 hydroelectric dams.⁴¹ But the plant, the nation's most powerful with a 3,300 megawatt capacity, as of December 1985, has not produced a watt of electricity in 9 months.⁴² During March 1985, TVA voluntarily stopped all power production at the plant, which had operated for 12 years, to overhaul its three reactors and bring them into compliance with Nuclear Regulatory Commission (NRC) guidelines. The combination of loss of power production at Browns Ferry and bringing the reactors up to NRC standards is costing TVA at least \$30 million in fiscal year 1986.⁴³ To meet one NRC regulation, Browns Ferry workers are testing virtually every weld, nut, and bolt in the \$1 billion plant to make sure it can withstand the shock of an earthquake.⁴⁴ As a result of the TMI incident, the NRC requires precise verification that all nuclear plant safety systems would continue operating in the harsh, radioactive atmosphere that would follow an accident.

While U.S. nuclear plants have skyrocketed in price from their contracting to completion dates, the same escalation has occurred throughout the Third World. While the ambitious Mexican and Brazilian programs have been seriously affected, the Argentine projects are supposedly only going to be slowed by one to two years.⁴⁵ Although senior

CNEA officials believe that Latin American states may be able to carry out major nuclear energy development, it is clearly recognized the costs may have become too large for the states to handle.⁴⁶ Argentina could be left financing numerous nuclear facilities that it really does not need.

Foreign Assistance

Foreign assistance, mainly from the West German Government and its commercial industry, has enabled Argentina to develop an independent nuclear program. It has been identified that West Germany has provided Argentina with reprocessing technology needed to extract weapons grade plutonium from spent fuel from the 1970's up to the present.⁴⁷ Although the Nonproliferation Act would require the U.S. to cut off nuclear exports to West Germany, it has not done so. The most important of these exports would be enriched uranium for West Germany's large nuclear power program.⁴⁸ Despite international safeguards and surveillance, the spent fuel stored at Atucha I, the power reactor acquired from West Germany, has a high plutonium content. The Argentine reprocessing plant at Ezeiza is being built with the assistance ~~from~~ ^{of} West Germany and Italy. The plant will have the capability of producing enough plutonium for two bombs a year. The plant is not subject to international controls.⁴⁹ For decades, West German scientists and engineers have worked in the Argentine nuclear industry. Former Third Reich nuclear and rocket experts moved their technology, their firms, and their intellectual abilities to South America to escape allied controls during and after the Second World War.⁵⁰

FOOTNOTES

CHAPTER II

¹Los Alamos National Laboratory, Los Alamos 1943-1945; The Beginning of an Era, LASL 79-78 Reprint (Los Alamos, NM: 1984), p. 54.

²Ibid., p. 49, 53-54.

³Daniel Poneman, Nuclear Power in the Developing World, (London: George Allen and UNWIN, 1982), p. 69.

⁴Ibid.

⁵Ibid.

⁶Ibid., p. 70.

⁷Ibid.,

⁸Douglas Tweedale, "Argentina," Nuclear Power in Developing Countries: An Analysis of Decision Making, ed by James Katz and Onkar Maruwah, (Lexington, MA: Lexington Books), p. 82.

⁹Ibid.

¹⁰Ibid.

¹¹Poneman, p. 70.

¹²Tweedale, p. 82.

¹³Ibid., p. 83.

¹⁴Ibid., p. 84.

¹⁵Ibid., p. 84.

¹⁶Ibid., p. 84.

¹⁷Poneman, p. 70.

¹⁸"Industry Faces Big Cutbacks; But Nuclear Programme is Most Advanced in Region," Latin American Newsletters, Ltd; Latin American Special Report, April 1985, p. 2.

¹⁹Poneman, p. 74.

²⁰Ibid.

²¹Ibid.

²²Ibid.

²³Leonard S. Spector, Nuclear Proliferation Today, (Cambridge, MA: Ballinger Publishing Company, 1984), p. 200.

²⁴Ibid., p. 201-202.

²⁵Ibid.

²⁶Ibid.

²⁷Ibid., p. 203.

²⁸Ibid.

²⁹Ibid.

³⁰Cynthia Watson, Argentina Nuclear Development: Capabilities and Implications, (Ann Arbor, Michigan: University Microfilms International, 1984), p. 91.

³¹Ibid., p. 92.

³²Ibid.

³³Ibid.

³⁴Ibid.

³⁵Ibid., p. 93.

³⁶Ibid., p. 94.

³⁷Ibid.

³⁸Poneman, p. 866.

³⁹Watson, p. 96.

⁴⁰Ibid.

⁴¹Curt Anderson, "Behemoth Nuclear Plant Inactive Since March," The Washington Post, 30 December 1985, Sec. A, p. 15:6.

⁴²Ibid.

⁴³Ibid.

⁴⁴Ibid.

⁴⁵Cynthia Watson, Argentina Nuclear Development: Capabilities and Implications.

⁴⁶Ibid., p. 97.

⁴⁷John Cooley, "West Germans Aid Brazilian and Argentine Nuclear Programs," The Christian Science Monitor, 6 June 1985, p. 12.

⁴⁸Ibid.

⁴⁹Ibid.

⁵⁰Ibid.

CHAPTER III

ARGENTINA AND GLOBAL NUCLEAR PROLIFERATION

. . . the strong, sustained awesome roar which warned of doomsday and made us feel we puny things were blasphemous to dare tamper with the forces heretofore reserved for the Almighty.

General Farrell¹
Trinity Site, July 1945
Alamogordo, New Mexico

Introduction

This chapter will focus on the various aspects of nuclear proliferation as they relate to Argentina. This will include Argentine nuclear fuel cycle features; public proclamations regarding nuclear treaties; nuclear weapon capabilities and possible nuclear weapon delivery platforms; involvement in the nuclear export market; and the constraints imposed by political, technical, and economic infrastructures. This chapter will enable us to examine and determine Argentina's potential for nuclear proliferation in the future.

Argentine Nuclear Program: A National Institution

As discussed in previous chapters, the nuclear program in Argentina has received a high priority for the past 30 years. It should always be remembered that it is Argentina's one success story in three decades of economic crises, political upheavals, and repression. As such, it commands widespread popular support and is a source of national pride.² The program is one of steady progress with basic decisions apparently having carefully

been considered. The Navy, under Admiral Castro Madero, controlled Argentina's power program from 1976 to 1984. It should be noted that in 1983, when the Navy left the ruling junta after the Falklands debacle, Admiral Castro Madero was the only naval officer who retained a high government position. President Raul Alfonsin in 1984 placed the CNEA under civilian control by appointing Alberto Constantine as its chairman.³

Argentina has been careful to keep all options open since its nuclear program began in 1949. It has pursued a policy of fierce independence, as will be discussed later, refusing to sign the 1968 Nonproliferation Treaty or to ratify the 1967 Treaty of Tlatelolco. Instead it has sought to develop its own technology wherever possible, taking care to diversify its suppliers. As previously indicated by the late 1970's, Argentina was in effective control of the entire nuclear fuel cycle which is based on natural-uranium, heavy water technology.

In 1983, Rear Admiral Castro Madero announced that Argentina had acquired the capability to produce enriched uranium, continuing on course in fulfilling his August 1982 proclamation that, "Argentina will be self-sufficient in nuclear matters by the year 2000."⁴

The 1983 announcement about the enrichment capability furthered suspicion that Argentina was committed to developing a nuclear bomb, particularly since Argentina's nuclear program is based on natural-uranium, heavy water technology and, as such, does not require enriched uranium. Making a nuclear device is by no means the only possible motive, however. Argentina could use the enriched uranium in its research reactors, as well as establishing itself as a supplier of nuclear material to other countries. It is possible that economics and ambitions for regional leadership were far more important in Madero's decision to pursue

enrichment technology, with domestic politics behind the timing of the announcement.⁵ The method employed by the enrichment plant is the gaseous diffusion process which would be useful for the production of sufficient fissile material to stock a small arsenal of nuclear weapons. Since Argentina mines its own uranium and the enrichment process is a domestic development, it is not subject to embargoes by foreign powers or inspection by the International Atomic Energy Agency.⁶ The U.S. was a factor in Argentina's enrichment decision when in 1978 President Carter announced that Washington would ban further supplies of nuclear materials to Argentina unless it signed the Nonproliferation Treaty. Argentina's response was to begin developing an enrichment capability and to make the acquisition of a heavy water plant a priority.⁷ Quite possibly there was also a motivation to match the enrichment capability West Germany was providing Brazil as part of a 1975 agreement.⁸

Policy Toward Nuclear Treaties

Latin America is the first populated area of the world to have been officially declared a Nuclear Weapon Free Zone. Provision for the zone was made in 1967 by the Treaty of Tlatelolco (TT). Holdouts on the treaty include Argentina and Brazil. The TT is not fully operative until all affected parties subscribe; however, some states, when acceding to the treaty, have exercised a "waiver" declaring that they would abide by the treaty's provisions pending its entry into force. Brazil and Chile have ratified the treaty, but not implemented the waiver and do not submit to full-scope safeguards agreements with the IAEA as required by the TT.⁹ IAEA safeguards are equally at the heart of Argentina's refusal to ratify the treaty. It claims discrimination by a system which tries to keep

nuclear technology out of the hands of non-nuclear weapon states.

Argentina refuses to allow IAEA monitoring of installations using solely Argentine technology -- that is the enrichment plant at Pilcaniyeu. TT faces a controversy in its own right since Article 18 of the treaty permits nuclear explosions for peaceful purposes -- supposedly for engineering activities -- but, in form, is indistinguishable from explosions for non-peaceful purposes.¹⁰

A key element in global nonproliferation remains the 1968 Non-Proliferation Treaty, of which the U.S., the Soviet Union, and Britain are the depository powers. States party to the NPT accept a system of IAEA verification to ensure that they are in compliance with the provisions of the treaty. Argentina and Brazil complain that the NPT discriminates unfairly against non-nuclear weapon states while reinforcing an imbalance between the states which possess nuclear arsenals and those which do not.¹¹

Carlos Madero had some strong opinions regarding the nonproliferation issue. He feels that the NPT provisions were out of phase with nuclear development for military applications already existing in some countries, and established the political-military hegemony of the few nuclear powers forever. In addition, these privileged few would have an advantage in nuclear industrial development. The five privileged weapon states have the advantage of being able to use special fissionable material for military purposes, such as propulsion, without having to declare it. Vertical proliferation is not contained as exhibited by the increase in the nuclear weapons inventory of the privileged states since the NPT was signed. The development of a nuclear power program is not the most logical, economical, or technical way to produce nuclear weapons. It may be unrealistic to expect that developing countries with substantial nuclear programs will

give a blank check regarding "full-scope safeguards" without the corresponding blank check regarding the transfer of technology, equipment, and services being given by supplier countries. On the other hand, it should be recognized that a unilateral abrogation of a supply commitment can entail an equally unilateral withdrawal of nonproliferation assurances.¹²

Despite this position, Argentina is a charter member of the IAEA. In fact, 20 Latin American and Caribbean countries are IAEA members -- including the big five NPT dissidents: Argentina, Brazil, Chile, Columbia, and Cuba. They have negotiated individual agreements covering "all significant nuclear activities of which the IAEA is aware." As the leading nuclear powers of the region, Argentina and Brazil hold the key to building nonproliferation confidence in Latin America. A breakthrough occurred earlier this year when the two countries agreed in principle to mutual reviews of all facilities, including the Pilcaniyeu Plant and Brazil's enriched uranium research facility at Sao Jose des Campos. Both Argentina and Brazil still claim support for the TT, which is politically far more acceptable than NPT for Latin American countries. However, this Argentine-Brazilian agreement could merely serve to bypass TT and escape IAEA aspirations to inspect unsafeguarded facilities.¹³

When the Alfonsín Government conducted internal debates on the nuclear issue in June 1984, it basically decided against signing the NPT and ratifying the TT on the grounds that both discriminate against the developing countries and block their development of a vital technology.¹⁴ A few months prior to this decision, the U.S. Ambassador in Argentina was quoted as saying he expected Buenos Aires eventually to ratify the TT. In keeping with the longstanding pressure the U.S. has maintained on Argentina

regarding the TT, Washington had made Argentina's ratification of the treaty a condition for supporting a \$500 million emergency financial package to help the country pay its foreign debt interest arrears.¹⁵ In January 1985, however, President Alfonsín indicated that Argentina would sign the Nonproliferation Treaty only if existing nuclear powers froze production and testing of nuclear weapons and if the accord did not prevent legitimate scientific research.¹⁶

Full-Scope Safeguards

There are some interesting aspects to the full-scope safeguards issue which continue to entangle Argentina. In the nuclear sales arena, the U.S. is pushing for full-scope safeguards under which a customer for nuclear sales must place not only the exported item but all its nuclear facilities under IAEA inspection. This is now required of American exports under the NPT. Canada, Australia, and Sweden have similar requirements; but most other suppliers, notably in Western Europe, continue to require safeguards only for the item exported. At a meeting in Luxembourg in 1984 the U.S. tried to persuade a dozen or so industrialized countries to adopt such a requirement, but met with only limited success. As a result, Argentina is not alone in refusing to comply with all of the nuclear rules desired by the nuclear powers.¹⁷

Some suspect that Argentina's apparent softening toward the NPT may be part of an Argentine propaganda campaign aimed at drawing world attention to the perceived failure of the superpowers to live up to the terms of the NPT. There is genuine fear in the U.S. that if there is no progress on arms control by the 1990's, non-nuclear countries will walk away from the NPT. In 1995 members must vote on whether the NPT is to be renewed.¹⁸

Alfonsín may not be in a political position to do what he wishes at this time anyway. A decision now by Alfonsín to sign the NPT or ratify the Treaty of Tlatelolco would probably have no chance of acceptance by the Argentine Congress and possibly the general public. Peronist nuclear experts also claim any regional or bilateral treaties that encompass full-scope safeguards or IAEA inspections of home-grown nuclear technology also face congressional veto.¹⁹

Even if full IAEA safeguards are applied one day throughout Latin America and the Caribbean, critics claim the IAEA cannot keep track of all nuclear materials, particularly as the stores of plutonium grow geometrically (approaching ~230 tons this year) as a result of irradiated and reprocessed reactor fuel.

Is Argentina Building a Nuclear Device?

During 1981, U.S. intelligence experts predicted that Argentina would win the race to produce South America's first atomic bomb by 1982. Argentina's foreign ministry admitted that the country could build a nuclear device but denied that it is doing so.²⁰ In September 1983, the Reagan Administration accused Admiral Castro Madero of planning "a bookkeeping error" to divert 1 ton of uranium to make nuclear fuel elements without telling the IAEA. The elements once irradiated could produce enough plutonium for a couple of bombs. The accusations came in a CIA report which said that Argentina intended to divert partially processed uranium ore from a plant built in West Germany.²¹ Intelligence sources, in January 1984, indicated that, with the enrichment plant Argentina has been testing and building, they could probably produce enough plutonium (about 6 kilograms) for a Nagasaki-type bomb within a year or so.²² During early

1985, an Argentine official stated, "We don't want nuclear arms or a nuclear arms race in Latin America. The facts show that Argentina has never developed nuclear weapons."²³

Speculation of this nature on an Argentine nuclear device has been going on from the late seventies to the present. Yet there is no evidence that Argentina has yet succeeded or that this is its primary intent. There is little question that Argentina today has the general scientific and industrial infrastructure necessary for the development of nuclear weapons. At present, however, the nation lacks facilities -- enrichment and reprocessing plants -- for the production of nuclear weapons materials in significant quantities, although both types of plants are under development.

If Argentina chooses to move closer to the possession of nuclear arms, it has several options. First it could complete the Ezeiza reprocessing plant and begin openly to reprocess spent fuel from its safeguarded reactors. This would have high political costs since Argentina would have to violate its safeguards agreements. Second, when the Ezeiza plant is completed, Argentina might attempt to obtain unsafeguarded plutonium openly. This time consuming option would require completing the unsafeguarded natural-uranium, heavy water RA-7 research reactor and building up an unsafeguarded capability to produce heavy water using technology from its indigenous pilot heavy water plant at Atucha. Another, quicker approach would be to obtain unsafeguarded plutonium partly through clandestine efforts, by bypassing safeguards and placing "extra" fuel in the Embalse or Atucha reactors.²⁴ Though the two reactors are inspected by IAEA personnel, heavy water reactors can be refueled while the reactor is running. Presumably, rods could be slipped into the reactor, irradiated

briefly (the best weapons grade plutonium comes from fuel only partially burned), and reprocessed in another country for the necessary weapons material.²⁵ The unsafeguarded Pilcaniyeu enrichment plant could produce another route to quantities of nuclear weapons material. Estimates of the time required for this plan vary from one to two years -- the announced timetable for completing the plant -- to five years or more, the view of some U.S. Government officials.²⁶

International Relations and Conflict in South America

Introduction

For many years it was possible to consider South America as a region of peace in comparison to so many other areas of the world.²⁷ Several reasons have caused a significant change in the state of affairs in this region, especially the Falklands conflict of 1982. There are a few informed optimists today who would predict that the South Atlantic war was an isolated event that could not be repeated in some other battlefield of the West Hemisphere.²⁸ The decision of the Argentine regime to recover the Malvinas Islands was motivated by a number of considerations, including personal ambition, military politics, and the rising pressure of internal economics and social problems.²⁹ Writings over the years have identified the geostrategic significance of the Malvinas, Falkland Islands, and their relationship to Argentina's Antarctic claims and the dispute with Chile over the Beagle Channel Islands. Within Brazil, Argentina, and Chile the currents of geopolitical thinking are beginning to have a significant impact on national policies and international relations of the region.³⁰ It is these three states that have most fully developed the concept of

state security based on the doctrine of national security. This segment of the paper will examine two major conflicts in the Southern Cone: the Southern Andean Conflict (Argentina-Chile-the Beagle Channel) and the Argentine-Brazilian rivalry (primarily a consideration of the nuclear issue).

Nuclear Conflict with Brazil

The theme of the Argentine-Brazilian rivalry and struggle for influence in South America is the oldest of all in the Latin American ~~conflicts~~.³¹ Despite this long-lasting rivalry, an outright military clash between Argentina and Brazil is not likely. But the rivalry is real and has important implications for conflict and international relations of the Southern Cone.³² One important aspect of the rivalry is competition for the arms market in the neighboring states. The Falklands conflict brought Brazil into the tangled Argentine-British-Latin American relationship in some interesting ways, and it seems clear that Brazil will continue to have a keen interest in developments in the area.³³ An ominous nuclear dimension is also present in the rivalry since Argentina and Brazil both possess a capability to construct nuclear weapons.

The nuclear aspects of the Argentine-Brazilian rivalry pose deeply disturbing concerns because both countries are "threshold nations" that could develop a nuclear device in the near future.³⁴ However, from the Argentine perspective, why would they want to develop a nuclear device, and what would they do with one if they had it? Interestingly, some foreign statesmen favor the idea of a Third World bomb. They have indicated that a nuclear bomb would give the Third World prestige in world councils as well as warning enemies and keeping the peace in the way many perceive nuclear

weapon states to have done.³⁵ At present, with Argentina, the capability to build a bomb appears to be mostly a matter of status. It seems unlikely that Argentina would choose to use a nuclear device against Brazil or other neighboring countries with which it does not have good relations, for fear of intervention by the U.S. directly or by some kind of multinational force. It certainly would not use it in a second attempt to capture the Falklands, since it is almost certain that Great Britain would retaliate in kind, with considerably more devastating effects. One thing is certain: if Argentina decides to join the nuclear club, Brazil would be under strong pressure to follow suit (moved more by patriotic pride than national security).³⁶

In the long term, Brazil's considerably greater resources could permit it to outstrip any nuclear weapons capability Argentina might develop, eliminating any short-term advantage Buenos Aires might enjoy.³⁷

The competition works both ways, Argentina does not want to be in a situation of not having a bomb if Brazil does. In 1983 Brazil raised eyebrows in Washington by using a small laboratory scale reprocessing unit to produce plutonium from a research reactor originally supplied by the U.S. Only a few grams of plutonium emerged, intelligence sources said at the time, and it was estimated that Brazil lacked the capacity to produce enough to make a bomb (five to six kilograms). Yet Brazil has signaled it intends to press on with weapons research despite international concern. Its research reactor is under inspection, as is U.S. fuel for it, but the Brazilians apparently used rods they had made themselves, claiming this was legal under its various agreements. Argentina has been alarmed by Brazil's action, especially in the wake of its own humiliating defeat by Britain in the Falklands.³⁸

As discussed earlier in this paper, Argentina's nuclear program is the oldest and most sophisticated in Latin America. While Argentina is self-sufficient with respect to its nuclear energy program, Brazil's program is making rapid progress. Presently, both countries have limited aircraft delivery systems for nuclear missions and are working on missile delivery systems.³⁹ Brazil's incentives to go nuclear are fewer than Argentina's because of its secure position in the rivalry, its relative stability, and its economic progress when compared to Argentina.⁴⁰ A possibility for both countries is the so-called Israeli option under which both states would move close to having an explosive device but would not cross the detonation threshold. This option affords ample opportunities for denials, psychological warfare, and bluffing.⁴²

Argentina-Chile Conflict

The dispute between Argentina and Chile involves the possession of three normally uninhabited and seemingly unimportant islands at the eastern entrance to the Beagle Channel, south of Tierra del Fuego: Nueva, Picton, and Lennox.⁴³ In late 1978, Argentina and Chile almost went to war over these islands.⁴⁴

The real possibility of war stems from causes much deeper than three rather useless islands. The hostilities are rooted in Chilean-Argentine tensions that go back to their independence and that have flared up over a number of border and territorial issues in the Southern Andes.⁴⁵ The Beagle Channel conflict is linked to Malvinas, Falkland Islands, and competing Antarctic claims. The role of Great Britain and the clash of Argentine and Chilean geopolitical thinking further exacerbates the situation.⁴⁶ The issue of how to define the line between the South

Atlantic and the South Pacific is one that has long caused problems in Argentine-Chilean relations.

The most significant developments in recent Argentine-Chilean relations are those stemming from the Falklands conflict. Chile was one of only two Latin American nations to abstain in key Organization of American States' votes that supported Argentina, and Argentines strongly suspected the Chilean Government and public opinion supported Great Britain.⁴⁷ There was also the uncomfortable feeling in Chile that the Argentine "recovery" of the Malvinas, Falkland Islands was but the beginning of a long process of Argentine aggressive actions in the south.⁴⁸ Another current of opinion held that Argentina would really have preferred to go to war with Chile to take the Beagle Channel Islands, but that the Vatican's role prevented them from doing so; thus, they had to settle for the Falklands conflict instead.⁴⁹

Argentina's rearmament program after the Falklands war has concerned Chile since there seems little prospect of any successful Argentine action against the reinforced British garrison on the islands, and many Chileans wondered if these weapons might be used against them.⁵⁰ From another perspective, the sale of British weapons to Chile (including bombers and a destroyer) and discussions over the awarding of landing rights to British aircraft at the airstrip in Punta Arenas, Chile, have heightened Argentine concern.⁵¹

Internal Issues

Internal Argentina politics will be a strong factor in the proliferation issue as the civilian government tries to strengthen control over the military. President Alfonsín is preparing draft legislation

proposing the reorganization of the CNEA and creation of two independent committees to monitor the agency's accountability for nuclear materials and safety. His advisors insist Alfonsin views the draft legislation as essential to ensure CNEA is accountable to Argentina's elected authorities. Passage of the draft bill is also seen by certain government officials as a prerequisite to a safeguards agreement acceptable to the IAEA.⁵²

Given the strong disincentives described in this section, it seems unlikely that the Alfonsin Government will accelerate the more provocative elements of the nation's nuclear program or otherwise signal an interest in developing a nuclear weapons capability. If in the end, however, Argentina's new leaders are not prepared to reverse the direction of their program by accepting added nonproliferation commitments, their most likely course might be a continuation of their predecessors of moving toward a nuclear weapons capability, but at a very cautious pace.⁵³

Nuclear Weapons Delivery Capability

If it were disclosed that Argentina had a nuclear device in its possession, that fact alone would be enough to cause concerns in the region and disquiet in the rest of the world. It would not be necessary for Argentina to demonstrate that it also had a delivery system, because it is taken for granted that a country with the desire to detonate a device could develop a system(s) to deliver it. This could mean delivery by truck for a target near enough or by an aircraft for a more distant point. Argentina has some military components in being and in development which could provide a credible, sophisticated delivery means.

At present, Argentina does not have a sophisticated delivery system although it could adapt aircraft in its current inventory such as the

Canberra bomber. However, if Argentina decides to make a large investment and take the strategic risks required to deploy nuclear weapons, they almost certainly would purchase or develop more advanced delivery systems.⁵⁴ With respect to a missile delivery system, we would consider the Condor C1-A3 solid fueled rocket.⁵⁵ This 75-150 km range rocket with inertial navigation is a high-performance multipurpose vehicle and has been designed for the space market, but also has potential tactical applications. The payload for the Condor has been configured for a throw-weight between 350 kgs ~~to~~ ^{and} 475 kgs.⁵⁶ It has been reported that Argentina is developing a longer range, two-stage version of the Condor C-1 that could have a range of 800 miles, giving it a capability of reaching the Falkland Islands from the Argentine mainland. This system will give Argentina an immediate advantage over neighboring countries. Reportedly, West German and Italian rocket experts helped in the development of the Condor at a laboratory in the city of Azul, 300 miles southwest of Buenos Aires. The Argentine Air Force has tested the Condor at a base near Chamical, in northwest Argentina.⁵⁷

What's Brazil's reaction to Argentina's missile program? The Sao Paulo newspaper, "O Estado de Sao Paulo," reported a Brazilian Air Force official as saying that the manufacture of medium-range air-to-surface missiles by Argentina would not affect the military balance in South America because, "in the next two years, Brazil will have its own weapon of that kind."⁵⁸

In addition to the Condor and the Canberra bomber, an excellent aircraft selection would be the Jaguar International, the export version of the Anglo-French Jaguar, which France and Great Britain have used in nuclear roles.⁵⁹ Whichever modern aircraft Argentina might chose, it would

have only moderate difficulty in converting the planes for a nuclear mission. Export versions of modern fighter-bombers have some computer-assisted bomb delivery capabilities and onboard computers that could be programmed for a nuclear role.⁶⁰ Although export models would not contain nuclear wiring and delivery hardware, Argentina could reconfigure the aircraft with simple but reliable nuclear safing, arming, fusing, and firing mechanisms.⁶¹

Establishing a survivable basing mode would be a large task for Argentina. With respect to aircraft, they could deploy fighter-bombers in hardened shelters at a number of dispersed airfields. Also, aircraft could be rotated frequently to other airfields and techniques of concealment and deception could be used to further increase survivability.⁶²

Nuclear Exporting

In view of the tremendous expenditures of money and resources that nuclear projects require, it is ironic the only two countries (Argentina and Brazil) in Latin America with the technical know-how and resources to produce nuclear weapons also have some of the worst economic and social problems of the region.⁶³ Those economic factors have been a part of Argentina's makeup for some time, however, and seem to be behind one clear aspect of her national policy: she wants to become a nuclear supplier. By doing so she hopes to enhance national unity and ease some of her economic development problems. Argentina is well aware of the one real advantage it has in Latin America over traditional nuclear suppliers; its freedom from any of the international treaties to which most states belong. As Admiral Madero said in 1982: "Argentina today can proudly point to collaborative agreements and projects underway with other Latin American countries in

which we demonstrate by our acts our vocation for transferring technology with no pretensions at domination."⁶⁴

By 1981 Argentina had nuclear cooperation agreements with nine Latin American states, including Brazil. Under a 1977 agreement with Peru, Argentina supplied a 10 Mw research reactor for which it undertook to provide fuel fabrication services. Argentina has provided extensive training and financial support to Peru. Argentina is also providing research reactors for Uruguay and Columbia. Argentina has also provided parts for Chile's two research reactors. Bolivia is also expected to buy a research reactor from Argentina. These states seem set to go for light water, enriched uranium technology, largely because it is cheaper and more widely available than Argentina's natural-uranium, heavy water fuel cycle. To become a successful supplier in the region, Argentina needed to develop this technology as well as its own. This was one of the most powerful motives behind the decision to build an enrichment plant.⁶⁵ In this process, Argentina has become the Third World's greatest supplier of nuclear assistance to other developing countries.⁶⁶

More recently, in response to U.S. concerns, Argentine officials said all future nuclear exports and imported nuclear technology will continue to be covered by IAEA safeguards.⁶⁷ This was welcomed news because on 15 April 1985 Argentina and China signed a cooperative umbrella agreement covering peaceful applications of nuclear energy. The agreement between the two countries covers nuclear research, generator design, construction and operation, uranium mining and conversion, and fuel rod fabrication. Both countries will also cooperate in nuclear regulatory processes and nuclear station security.⁶⁸ This could be an unprecedented opportunity for Argentina since the PRC plans to build 10 nuclear power plants over the

next 15 years.⁶⁹ Although the agreement carries no assurance of future orders from China, beleaguered Argentine nuclear officials hope otherwise, since Argentina's nuclear industry is said to be operating at only 30 percent of capability.⁷⁰

Argentina and South Korea are discussing ways to boost economic and scientific cooperation, although it is unclear if Seoul wants to include nuclear energy in a future nuclear cooperation pact. Industry sources said another possible export market could be Yugoslavia, whose nuclear authorities have sounded out Argentina this year on increasing nuclear cooperation.⁷¹ In June 1985 it was announced that Argentina will build a 500 Kw nuclear research reactor for Algeria, representing Argentina's first major agreement of its kind with a Middle East country.⁷²

In summary, Argentina is making progress in its nuclear program, but progress is slow and many of the encouraging initiatives have yet to pay dividends. In a February 1985 interview, Rear Admiral Oscar Quihillalt, a former Argentine Chairman of the CNEA and now head of a private nuclear consortium, concluded that the Argentine nuclear program will not progress without economic and financial support. The Atucha II nuclear power plant is three years behind schedule and the next power station has not even been started. Workers are not getting paid and it is increasingly hard to keep them from moving to other jobs. He believes that it will be very difficult for Argentina to export nuclear technology because there is so much competition and it is essential to have financing. Argentina seems to be caught in a Catch 22 in that it wants to export nuclear technology to earn

money, but it needs money in order to export. It has succeeded in some long-range planning to bring itself to the doorstep of becoming a successful exporter. Time will tell whether it will be able to overcome the remaining obstacles.⁷³

FOOTNOTES

CHAPTER III

¹Los Alamos National Laboratory, Los Alamos 1963-1965, The Beginning of an Era, LASL 79-78 Reprint (Los Alamos, NM: 1984), p. 53.

²Judith Perera, "Argentina's Nuclear Red Herring," New Scientist, 8 December 1983, p. 726.

³"Argentina's Membership in Nuclear Club Imminent," Microwave Systems News, January 1984, p. 36.

⁴Department of Energy, Nuclear Options in Latin America, December 1983.

⁵Judith Perera.

⁶Argentina's Membership in Nuclear Club Imminent.

⁷Judith Perera.

⁸Leonard Spector, "Nuclear Proliferation Today," Ballinger Publishing Co., Cambridge, MA, 1986.

⁹Department of Energy.

¹⁰"The Nonproliferation Issue; Controlling Powers - Weapons Links," Latin America Special Report, April 1985, p. 6.

¹¹Department of Energy.

¹²Nuclear Energy - Europe and the World Congress: 8th, 1982, Lousanne, Switzerland, "How Argentina Looks at Nonproliferation."

¹³The Nonproliferation Issue.

¹⁴"Argentina Rejects Nuclear Pacts; NPT and Tlatalolco are Discriminatory," Latin America Weekly Report, 15 June 1984, p.6.

¹⁵"Argentina Will Ratify Nuclear Treaty, Says U.S. Ambassador," Reuters North European Service, 31 March 1984.

¹⁶"Argentina Sets Condition for Signing Nonproliferation Pact," Reuters North European Service, 31 January 1985.

Budgetary Effects on the Nuclear Program

The economic situation of the Argentine nuclear program during 1984 was characterized by a budget cut that practically strangled the program, causing the halting of almost all construction, the postponement of planned projects, and the operation of plants at levels below their full potential. To maintain the timetable of the original program, the CNEA would have required a budget of \$950 million in 1984. The budget was cut to \$250 million. The interest on and amortization of its debts also presented a somber side of the CNEA budget picture. In 1984 the CNEA had to pay 12 bn pesos of interest on its total debt. The CNEA had to refinance another 38 bn pesos, which is part of the principal of the foreign debt it had contracted. The long-range debt is \$800 million, scheduled for repayment up to the year 2003, with current servicing of \$42 million a year. The CNEA's financial situation would not have been so serious if the Energy Commission had not implemented a policy which reduced the nuclear plants to operation at 60 percent capacity.³

The situation of the projects under development is even worse. The most important ones are Atucha II (690 MW capacity plant; \$1.7 billion investment), the Arroyito heavy water plant (annual output of 250t; \$600 million investment), the spent fuel reprocessing plant (annual output of 40t; \$500 million investment), and the uranium enrichment plant (output of 500 kg of U-235 enriched to 20 percent; a \$130 million investment). Very little progress was made on these projects in 1984. In all cases, the CNEA has suspended the payments, compelling the construction companies to run up debts, or in more than one case, to close. The effects of budget cuts on the uranium and fuel production sectors were less serious, partially because lower load factors mean the use of smaller amounts of

fuel. But it must be kept in mind that for the nuclear plants to return to their normal level of operation, production will have to increase substantially.⁴

One of the areas in which the CNEA had the worst difficulties was that of salaries, which were excluded from most of the readjustments granted to the other public sectors in 1984. The real salaries of CNEA researchers and professionals ^{or} shrank by 50 percent. There is certainly a concern about a stampede to other occupations or abroad. The exodus of scientists and technicians seems inevitable, as does the shutdown of important related private companies. Behind all this, the ugly spectre of power shortages raises its head.⁵

Alternatives to Nuclear Power

To solve Argentina's energy needs during this period of financial crisis, the government is considering other alternatives to nuclear power. A proposed five-year strategic plan for economic ^{or} growth released in January 1985 advocates that the existing nuclear program be redefined to reflect recent increases in abundant natural gas reserves. The plan argues that, with gas reserves proven at 680,000 billion cubic meters and probable at 300 to 500 trillion cubic meters, the "preeminence of nuclear and hydroelectricity no longer applies" for Argentina's energy planning. The plan advocates completion of ongoing projects, including the Atucha II nuclear plant and the 2,100 Mw Piedra del Aguilla hydro plant in Patagonia as an energy hedge since present idle electric generating capacity is expected to be absorbed by 1990. The government does not foresee the need for "any new important energy project before 1989." This could move the fourth nuclear power plant into the next century.⁶

In March 1985 there were indications from the Argentine Government that it might give precedence to hydroelectric generation of power rather than nuclear. Nuclear power is described as more of a prestige project which should yield to more sensible alternatives.⁷

Political Controversy

The pro-nuclear faction in Argentina disagrees with the apparent energy policy shift as being shortsighted. Alberto Constantini, now the Chairman of the CNEA, regrets that nuclear development is regarded as merely a source of electricity. He points to other peaceful uses in health care and food storage and production. According to Constantini, "History tells us that when there is a technological setback, the whole country reverses." Argentina has spent about \$7 billion in the last 15 years to develop its nuclear industry.⁸ From 1976-1983, nuclear energy outlays comprised at least 15 percent of total public works investment. It is described as the only technology-intensive area in which Argentina is internationally competitive. An indication of that was provided by Kraftwerk Union of West Germany, which formed a joint venture with the CNEA to bid for a nuclear plant construction program in China and India.¹⁰ The pro-nuclear people worry that, without strong support from Alfonsín, Argentina may be unable to preserve its achievements in the nuclear field -- including virtual fuel cycle independence -- endangering national security, sovereignty, and prestige.¹¹ Industry sources say that Argentina's nuclear industry has been compromised by the government's financial dependence on the U.S. Washington does not approve of the Argentine nuclear program, among other things because of Argentina's refusal to ratify the Tlatelolco Treaty, a decision that the Argentine

Government would hardly be in a position to reverse without creating a turmoil within the country.¹² With opinion polls showing the public overwhelmingly supports Argentina's nuclear program, Peronists warn the government must walk a tightrope in its bid to reorder the mission of the CNEA.¹³

In May 1985 President Alfonsín outlined the priorities of the nuclear plan as follows: (1) Preserve the human resources of the CNEA. (2) Disseminate throughout the country the various uses of radioisotopes and radiation. (3) Maintain the tempo of the projects already underway, whenever possible within the limitations of the credits which can be assigned to them. He stressed that despite budget restrictions, the CNEA would be meeting some important near-term objectives such as extraction of the first bars of cobalt-60 from the reactor of the Embalse nuclear center and the continuation of the building project of the Peruvian nuclear center and the fulfillment of all international and bilateral commitments regarding delivery of goods, training of personnel -- particularly in Latin America -- and making experts available.¹⁴ In an interview during the same time period, the head of the CNEA discussed the continued feasibility of a nuclear powered submarine, begun under the military regime, which was not paralyzed due to budgetary restrictions. He said the project had not been abandoned as the 15 Mw reactor designed for the submarine could also be used to generate electricity in remote areas such as the jungle and forested regions of Brazil and Peru.¹⁵

Trends

Obviously current economic pressures have forced the Argentine nuclear industry into an extremely depressed state. The strongest force for promotion of the industry, however, is the intense support of the people. Popular support can mean everything in a democracy, which Argentina is trying to become. The national will is very apparent to Alfonsín, who is walking a tightrope trying to keep the industry alive. There certainly do not appear to be sufficient resources to fund both military and peaceful nuclear activities, and the president has shown no inclination to promote the development of a nuclear weapon. The Argentines are a proud country and their nuclear technology is the one area that gives them prestige in Latin America. It appears that they have no other choice but to keep the industry alive in a peaceful direction on a reduced scale. Nuclear exporting appears to fit this bill perfectly since it promotes the industry and brings in added revenue at the same time.

FOOTNOTES

CHAPTER IV

¹U.S. Congress, Senate Committee on Governmental Affairs and House Committee on Foreign Affairs, Nuclear Proliferation Factbook, Hearings (Washington: U.S. Government Printing Office, 1980), p. 24.

²"Argentina Forces: Outside View," Latin American Regional Reports: Southern Cone, 2 August 1985, p. 5.

³"Argentina, Comment on the Nuclear Programme," 1985, The British Broadcasting Corporation: Summary of World Broadcasts, 8 January 1985.

⁴Ibid.

⁵Ibid.

⁶Richard Kessler, "Argentina's Five-Year Plan Favors National Gas Over Nuclear Development," Nucleonics Week, 17 January 1985, p. 10.

⁷"Argentina Stalls on a Nuclear Future," Latin American Regional Reports: Southern Cone, 2 March 1985, p. 4.

⁸Ibid.

⁹Richard Kessler.

¹⁰Argentina Stalls on a Nuclear Future.

¹¹Richard Kessler.

¹²Argentina Stalls on a Nuclear Future.

¹³Richard Kessler.

¹⁴"Argentina: Plan for Civilian Use of Nuclear Energy," The British Broadcasting Corporation; Summary of World Broadcasts, 14 May 1985, p. 1.

¹⁵"Argentina to Continue Nuclear Reactor Research," The British Broadcasting Corporation; Summary of World Broadcasts, 23 May 1985, p. 3.

CHAPTER V

FUTURE NUCLEAR OPTIONS FOR ARGENTINA

The atomic age has moved at such a pace that every citizen of the world should have some comprehension, at least in comparative terms, of the extent of this development, of the utmost significance to everyone of us.

President Dwight Eisenhower¹
United Nations General Assembly
8 December 1953, New York, New York

Introduction

The previous chapters have discussed Argentina's nuclear power capabilities, regional issues, economic concerns of sustaining a nuclear power program and the likelihood of this country utilizing its civilian nuclear technology for military purposes. In this chapter, we will explore the future nuclear options that Argentina has at its disposal. We will objectively analyze the various options. The future nuclear choices of Argentina can be grouped into four broad options: (1) using nuclear technology in electric power programs and for other civilian, nonexplosive purposes; (2) supplying other nations with nuclear technology; (3) developing peaceful nuclear explosives; and (4) developing nuclear weapons with the Argentine Armed Forces.²

User of Nuclear Technology

Presently, Argentina is well down the road in pursuit of this option. As previously discussed, Argentina is making costly investments to acquire an independent large-scale nuclear fuel cycle.

Argentina has supplied Peru with a zero power training reactor, for which Peru is acquiring fuel from the United States through Argentina.¹¹ The Argentine-Peruvian agreement also calls for the transfer to Peru of a low power (10 Mw) reactor for radioisotopes. This reactor will be similar to the one that the Argentines have operated at Ezeiza for over a decade.¹² In addition to supplying research reactors, Argentina will provide equipment for medical and agricultural use, for the treatment of uranium ores, and for uranium prospecting, and civil engineering structures for a nuclear complex.¹³ The Argentine-Peruvian program is in many respects a model comprehensive agreement for nuclear cooperation between two Third World nations that have different levels of experience in the nuclear field.

Peaceful Nuclear Explosives

Argentina has stoutly maintained its "right" to exercise a peaceful nuclear explosives (PNE) option. However, its credibility of the PNE rationale is not what it once was.¹⁴ Despite early hopes, the U.S. peaceful nuclear explosive program, under the auspices of the Atomic Energy Commission, never passed the experimental stage. The problems in using peaceful explosives were found to be considerable: the dangers of long-lived radioactivity (and the potential difficulty of marketing even slightly radioactive products); the extreme difficulty of controlling the technical results from such large explosions; and the possibility of seismic shock waves that could damage buildings and other installations miles away.¹⁵ To be "clean" such explosions must be thermonuclear (fusion-fission), but there are limits on how much the fission component of

a thermonuclear explosion can be reduced. Also the fusion part of the explosion produces some radioactivity itself.¹⁶

If Argentina were to exercise the PNE option, it would arouse regional and international suspicion that it has done so for military reasons. Even without testing, an effort to develop nuclear explosives might not escape notice.¹⁷ With warning, hemispheric and other nations would bring strong diplomatic pressure to bear.

There are other reasons to believe that the benefits of explosives testing would be greater for Argentina than they were for India in 1974.¹⁸ The security environment in the Southern Cone is more tranquil than in South Asia.

On the other hand, the effects on Argentina detonating nuclear explosives might not be completely adverse, at least after a period of years following a detonation.¹⁹ For years Argentina has aggressively maintained its right to detonate peaceful devices at little political cost in the region (although an actual test could dramatically change regional attitudes). Foreign nations have economic and other tangible interests in Argentina; these interests would probably continue whether or not a test takes place.²⁰

Weapons State

The final option is for Argentina to develop and deploy nuclear weapons. Argentina could achieve the capability of a "small nuclear force" which is one that can launch a credible first strike against a regional power but cannot expect to threaten a second strike against strategic targets of either superpower.²¹ A small nuclear force would, however, be capable enough to make its "owner" reasonably confident of maintaining

regional finite deterrence (that is, a force capable of surviving a nuclear strike by another regional power with a small nuclear force and inflicting heavy damage in retaliation).²²

The largest hurdle that Argentina would have to overcome to establish a small nuclear force is obtaining the necessary explosive materials, highly enriched uranium or plutonium. Having a long experience with nuclear technology, including heavy water production and reprocessing, Argentina would find it fairly easy to acquire weapons grade plutonium.²³

To deploy small nuclear forces, Argentina would have to adapt or acquire new delivery systems, devise survivable basing modes, and develop reliable and secure command, control, and communications systems linking national command authorities to the nuclear forces.²⁴ The aspects of Argentina's capabilities relating to nuclear delivery systems was discussed in Chapter III.

Inasmuch as Argentina has competent and disciplined military forces, it would face no insurmountable obstacles in putting into place adequate command structures for decisionmaking on nuclear employment. The instabilities inherent in its military regime, however, would weaken these structures and heighten the risk of nuclear accidents.²⁵ The secure communications and control equipment needed probably could be purchased abroad and procedures could be developed and practiced.

If Argentina chose to build a small nuclear force, to what uses would they be put? Probably it would view its nuclear forces primarily as a strategic deterrent. There is no apparent reason to believe that Argentina would be motivated to launch a strategic offensive attack against another nation or using its weapons in tactical roles (such as to blunt enemy

armored assaults in strategic corridors).²⁶ Eventually, Argentina would try to acquire better reconnaissance capabilities to provide earlier warning and monitor enemy deployments.²⁷

FOOTNOTES

CHAPTER V

¹U.S. Congress, Senate Committee on Governmental Affairs and House Committee on Foreign Affairs, Nuclear Proliferation Factbook, Hearings (Washington: U.S. Government Printing Office, 1980), p. 24.

²Joseph Yeager, Nonproliferation and U.S. Foreign Policy, (Washington, DC: Brookings Institute, 1980), p. 270.

³*Ibid.*, p. 271.

⁴*Ibid.*

⁵*Ibid.*

⁶*Ibid.*

⁷*Ibid.*

⁸*Ibid.*

⁹*Ibid.*

¹⁰*Ibid.*

¹¹*Ibid.*, p. 272.

¹²*Ibid.*

¹³*Ibid.*

¹⁴*Ibid.*, p. 273.

¹⁵*Ibid.*

¹⁶*Ibid.*, p. 274.

¹⁷*Ibid.*

¹⁸*Ibid.*

¹⁹*Ibid.*

²⁰*Ibid.*

²¹*Ibid.*, p. 275.

²²Ibid.

²³Ibid.

²⁴Ibid.

²⁵Ibid., p. 277.

²⁶Ibid.

²⁷Ibid.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The world's nuclear problem countries are working as hard as ever on developing the ability to make nuclear weapons.

Senator Charles H. Percy, Chairman¹
Committee on Foreign Relations
Congressional Hearings
30 September 1983

Introduction

The research for this paper led the authors through very complex issues. That is, the examination of the nuclear capabilities of Argentina, the consideration of global and regional concerns should Argentina decide to develop and deploy nuclear weapons as well as what might motivate a country to follow such a path. Finally, we reviewed available literature to determine the technical capabilities of Argentina to develop into a weapons state.

Conclusions

The regional security environments of Argentina seem benign. Its nuclear choices are not predetermined. Many factors influence the choices. The acquisition of nuclear weapons by Argentina would put strong pressure on other actors in the region, principally Brazil, to do likewise. A possible distortion of its nuclear options could relate to a military dispute between Argentina and one of the regional actors. Such an incident could lead to prolonged tension in the Southern Cone and persuade Argentine

Raul Alfonsin's austerity program. Alfonsin stunned the country in June of 1985 when, to combat an annual inflation rate that had topped 1,000 percent, he imposed a freeze on prices and wages, put a stop to the printing of new money to finance the budget and introduced a new currency, the austral, to replace the often devalued peso.

If we accept the hypothesis, Argentina is not embarking on a program to become a weapons state, then why do they publicly leave open the weapons option. The answer lies in what the nuclear option gives to the Argentine foreign policy. If Argentina is capable of becoming a weapons state, then the international community must recognize the effects that such a weapon could have. The often proclaimed nuclear option becomes a bargaining chip that such a state never had in the past. Even by not going as far as to develop the weapon but having the sheer capacity to do so gives a state an increased international respect.

Within the Latin American subsystem, Argentina's position due to its nuclear capacity has led to a cooperation with Brazil that had been lacking for much of the past. Brazil was willing to take up Argentina's offer to share material and knowledge. Other states in the region, such as Chile, may have been less affected by the nuclear option because they were never in a position to threaten Argentina.

On the international scene, Argentina has become a quasi nuclear weapons state, and it reacts more positively to those states that treat it as a nuclear equal than those governments that seek to force it to conform to the international nonproliferation systems. The international community still fears, however, that the weapons option might be chosen, and reacts to Argentine nuclear development accordingly. If Argentina went nuclear, it would undercut regional as well as global security. In doing so, the

option would be lost and Argentina would lose its bargaining chip. The responsibilities of being a nuclear weapons state includes the necessity of developing a defense system because neighboring states immediately feel threatened by a state that has nuclear weapons. Those neighboring states begin a reactionary position of arms development. Economically, Argentina is not in a position to develop a small nuclear force let alone a required defense system. The highly developed industrial complex of Brazil would have the capability of developing a countervailing nuclear capacity in a short time if it felt threatened by Argentina.

Argentina has reached a position that it sought and it is most likely to remain a quasi nuclear weapons state for the foreseeable future. Argentina would most likely develop weapons only if it were directly threatened by nuclear arms. The future for Argentina lies in moving from a nuclear recipient into the position of being a nuclear supplier state, rather than from its position as a quasi weapons state into a full nuclear weapons state.

Recommendations

The United States in the past has not been successful in changing the direction of the Argentine nonproliferation policy. For example, it failed to persuade European suppliers to require full-scope safeguards as a condition for major nuclear cooperation and did not convince Argentina to ratify the Tlatelolco Treaty. Today, however, the U.S. is at the crossroads of nuclear diplomacy with the Argentine Government. Efforts should be undertaken to help reduce the risk of proliferation in the

Southern Cone. Set forth are a number of courses of action the United States might wish to implement in order to reduce our nuclear concerns with Argentina:

1. Urge Argentina's main nuclear suppliers (West Germany, Canada, and in the future Switzerland) to adopt a policy of ceasing nuclear cooperation with Argentina unless it accepts full-scope safeguards;
2. Consider ~~to~~ the establishment of a multinational fuel cycle park (placing all the nuclear facilities in one location) in South America. This concept would face a number of obstacles. Argentina would be reluctant to participate in any center not located at home. Argentina has no need for enriched uranium (this would change if they moved to a light water reactor system). But it is now too late for the United States to offer current-generation enrichment, heavy water, and reprocessing technology, and expect Argentina to abandon their national efforts. In the future an attractive offer of advanced American technology for a multinational fuel center, including Brazil and Argentina as technological and commercial partners, might be persuasive;
3. Employ elements of American foreign policy such as conventional arms transfers and security assurances to assist Argentina in dealing with threats from other actors in the Southern Cone. This would enhance Argentina's capability to defend itself against a strong aggressor without the requirement to resort to developing a small nuclear force.

FOOTNOTES

CHAPTER VI

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GLOSSARY

CIA	Central Intelligence Agency
CNEA	Comision Nacional de Energia Atomica
IAEA	International Atomic Energy Agency
Km	Kilometer
Kw	Kilowatt
LWR	Light Water Reactor
Mw	Megawatt
NPT	Nonproliferation Treaty
NWFZ	Nuclear Weapons Free Zone
NWR	Heavy Water Reactor
PNE	Peaceful Nuclear Explosives
Pu	Plutonium
T	Ton
TT	Treaty of Tlateloloc
U	Uranium

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